

ANSWERS: Crystal ball questions on Enthalpy change calculations

<p>1) i) 2 moles of Mg gives out 1200kJ of energy so, 1 moles of Mg gives out 600kJ of energy ii) 0.35 moles of Mg gives out $600 \times 0.35 = 210\text{kJ}$ iii) 1 mole of Mg = 24g mol^{-1} so, 24g = 600kJ of energy released 1.5g will release $(600 \times 1.5)/24 = 37.5\text{kJ}$ of energy</p>	<p>2) i) $M(\text{Al}) = 27\text{ g mol}^{-1}$ 2.1g of Al releases 70.3kJ of energy 1g of Al releases $70.3/2.1 = 33.476\text{kJ}$ so 27g of Al releases $27 \times 33.47 = 903.857\text{kJ}$ ii) 1 mole of Al releases 903.857kJ ratio of Al : Fe in the equation is 1:1 so, 1 mole of Fe also releases 903.857kJ ? moles of Fe releases 240kJ $240/903.857 = 0.2655\text{moles}$ 1 mole Fe = 55.9g mol^{-1} $0.2655\text{ Fe} = ?\text{ g} = 0.2655 \times 55.9 = 14.84\text{g}$</p>
<p>3) 1640kJ needed = ? moles of sucrose needed $5650/1640 = 3.445\text{moles}$ 1 mole sucrose = 342g mol^{-1} so 3.445 moles sucrose = $342 \times 3.445 = 1178.19\text{g}$</p>	<p>4) $M(\text{C}_8\text{H}_{18}) = 114$ density = $\frac{\text{mass}}{\text{volume}}$ so mass of petrol burnt = density x volume = $0.698 \times 40 \times 1000$ (to convert to cm^3) = 27920g $114\text{g of petrol} = 5530\text{ kJ mol}^{-1}$ $27920\text{g of petrol} = ?$ The energy released = $27920/114 \times 5530 = 1.35 \times 10^6\text{ kJ}$</p>
<p>5) 1 mole of propane releases 2220kJ of energy $0.256\text{moles} = 0.256 \times -2220 = -568.32\text{kJ}$</p>	<p>6) density = $\frac{\text{mass}}{\text{volume}}$ so, the mass of ethanoic acid is $1.05 \times 1.5 \times 1000$ (to convert dm^3 to cm^3) = 1575g 1 mole of ethanoic acid = 60 g ? moles = $1575/60 = 26.25\text{moles}$ 1 mole ethanoic acid produced liberates 356kJ of energy</p>

so, 26.25 moles = $26.25 \times 356 = 9345$ kJ of energy

ii) 1 mole of ethanoic acid releases 356 kJ of energy

? moles of ethanoic acid releases 3×10^4 kJ of energy = $3 \times 10^4 / 356 = 84.269$ moles

1 mole of ethanoic acid = 60 g

84.269 moles = ? g = $60 \times 84.269 = 5056.14$ g

density = $\frac{\text{mass}}{\text{volume}}$

so volume = $\frac{\text{mass}}{\text{density}} = 5056.14 / 1.05 = 4815.371 \text{ cm}^3 = 4.82 \text{ dm}^3$ or 4.82 L